

THE CYTOLOGY AND ANATOMY OF *OXYCHILUS ALLIARIUS* (MILLER) (MOLLUSCA, ZONITIDAE), A NEW INTRODUCTION TO SOUTH AUSTRALIA

BY HELENE M. LAWS, CURATOR OF MARINE INVERTEBRATES,
SOUTH AUSTRALIAN MUSEUM

SUMMARY

Oxychilus alliarius (Miller), previously recorded from New South Wales, is now known to occur in South Australia. The radula, reproductive system and chromosomes are described from specimens taken at Glen Osmond, Adelaide, South Australia, in 1965.

INTRODUCTION

Oxychilus alliarius (Miller), a member of the family Zonitidae, is native to central and western Europe and Iceland. It has been introduced into the United States (Burch, 1960; Pilsbry, 1946; Taylor, 1914) where in New York, New Jersey, Colorado, Michigan and California it is a pest of greenhouses and sometimes gardens; it has also been recorded from South Africa (Quick, 1952) and New South Wales (Cotton, 1954).

In June, 1965 snails were collected in quantity from a garden in Glen Osmond, Adelaide, South Australia; these agree most closely with descriptions of *O. alliarius*.

METHODS

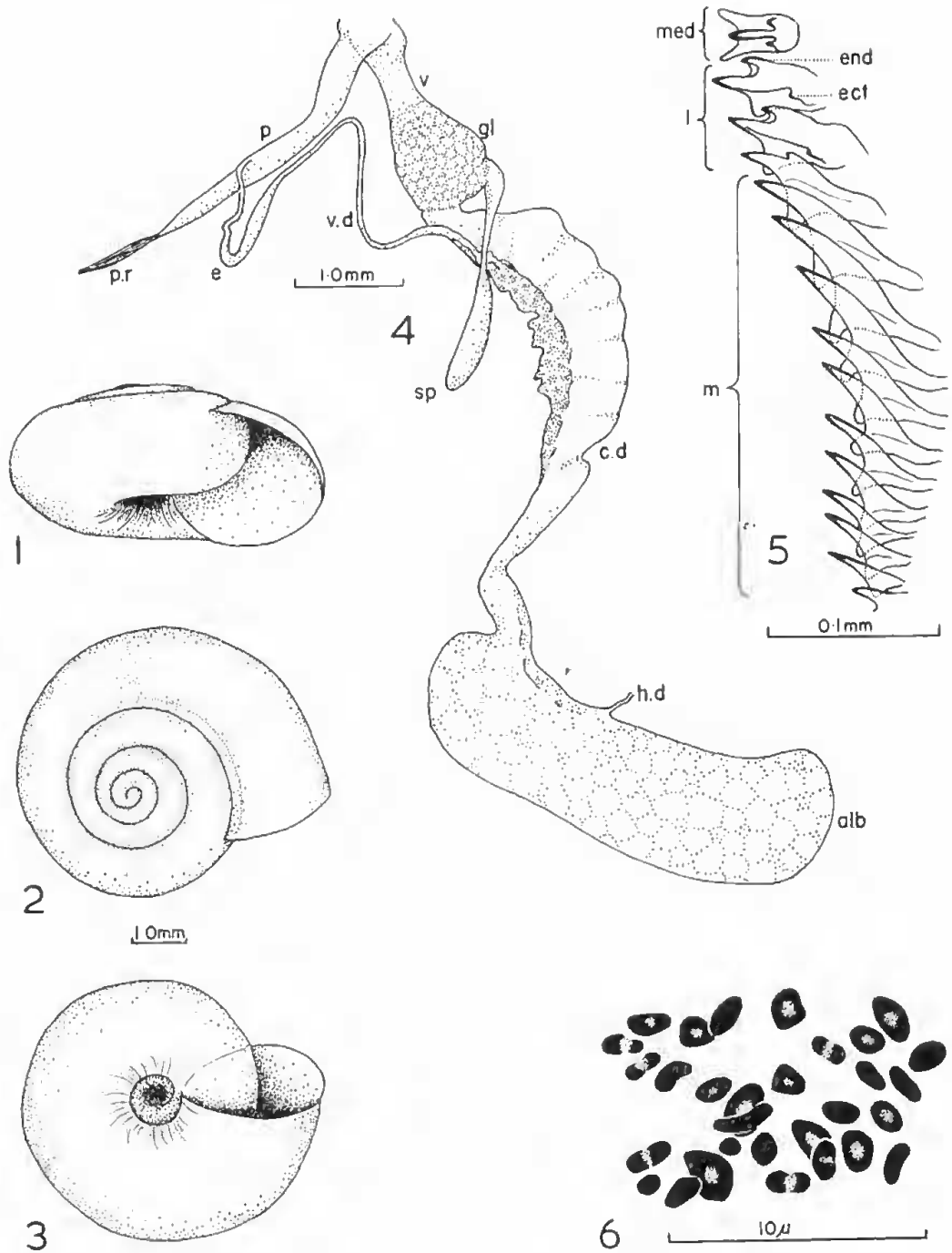
The reproductive system was dissected out from snails drowned overnight in water; it was spread on a slide, held flat by the weight of a second slide, and fixed in Bonin. Staining was with borax carmine (short method; Pantin, 1948) and dehydration followed Gregg's method for pulmonate reproductive systems (1958).

For cytological observations squash preparations were made in aceto-orcein.

Voucher specimens and slides of the radula, reproductive system and chromosomes are in the South Australian Museum collection, Reg. No. D14884.

OBSERVATIONS

The shell (fig. 1-3) is small, highly polished and of a transparent pale amber colour although in life the darkly pigmented body of the animal shows through; the size range for seven specimens is as



LEGEND TO FIGURES

Fig. 1-3. Lateral, dorsal and ventral views of a shell of *Oxychilus allarius* (Miller).

Fig. 4. Reproductive system of *O. allarius*:—alb, albumen gland; e.d, common duct; e, epiphallus; gl, glandular tissue; h.d, hermaphrodite duct; p, penis; p.r, penial retractor; sp, spermatheca; v, vagina; v.d, vas deferens.

Fig. 5. Radula of *O. allarius*:—med, median; l, laterals; m, marginals; ect, ectocone; end, endocone.

Fig. 6. Meiotic chromosomes of *O. allarius* at diakinesis of spermatogenesis; $n = 30$.

follows: greatest diameter, 6.0 to 6.7 mm, mean, 6.38 mm; height, 2.8 to 3.3 mm, mean, 3.03 mm. It is depressed and umbilicate (umbilical diameter, 0.8 to 1.2 mm, mean 1.02 mm), the umbilicus clearly showing the penultimate whorl; the aperture is ovate-lunate with a straight and unthickened lip and the last whorl does not descend. There are 4 to $4\frac{1}{2}$ whorls and the sculpture of the shell surface consists of very fine growth lines.

The animal is dark grey on the dorsal surface of the head region and collar, shading to lighter grey and with a pale sole. Pedal and supra-pedal grooves are present and the sole of the foot is faintly tripartite. When disturbed and particularly when the upper visceral whorls were opened for gonad samples, the "inhabitant smells strongly of garlic" (Miller, 1822).

The Radula. The radula (fig. 5) is similar to that shown (Taylor, 1914) for *O. alliarius* but in the Glen Osmond specimens the ectocone of the first and second laterals is a simple, but very reduced, cusp rather than a serrated one, as in Taylor's material. The third lateral is transitional, being very similar to the marginal teeth except for a weakly developed endocone. It is closer to the radular pattern shown by *O. cellarius* (Müller) (Taylor, 1914; Pilsbry, 1946). The radular formula is 11.3.1.3.11.

Reproductive System. In *Oxychilus* the atrium is short and the vagina long by comparison and covered by glandular tissue which also extends over the base of the spermathecal duct; this duct is considerably shorter than the common duct. There is a terminal penial retractor and the epiphallus is inserted well below the apex of the penis. The Glen Osmond material shows all these features (fig. 4) but the spermatheca is more elongate than in Taylor's material.

Cytology. Very few meiotic figures could be obtained from the Glen Osmond specimens and only one snail, of many which were tried, gave a satisfactory chromosome count. The chromosome number from meiosis in primary spermatocytes, is $n = 30$ (fig. 6). There are two large bivalents and a gradual reduction in size throughout the remaining chromosome pairs; this can also be seen in spermatogonial mitoses although there accurate counts could not be made.

DISCUSSION

The snails described above agree with descriptions of *Oxychilus alliarius* (Miller) in most respects—the size and shape of the shell, number of whorls, broad umbilicus, strong garlic smell and the body pigmentation. They do, however, show two points of difference; the

first and second lateral radular teeth have simple ectocones rather than the serrated cusp described by Taylor. In addition, the spermatheca is elongate rather than oval to spherical. Taylor's observations were, however, made on British material; there is no information available for continental representatives of *O. alliarius*.

With regard to radular and spermathecal anatomy the Glen Osmond specimens come closer to *O. cellarius* (Müller), but the balance of characteristics do tend towards *O. alliarius* and it seems best to regard the South Australian material as belonging to this species.

The collection of *O. alliarius* from Glen Osmond is not, in fact, the first to be made in South Australia. In the South Australian Museum there is a single collection of *O. alliarius* shells made at Linden Park in December, 1962; their identity had not previously been realized.

ACKNOWLEDGMENTS

The author wishes to express her thanks to Miss M. Angel, University of Adelaide, for the Glen Osmond collection of living *Oxychilus alliarius*.

REFERENCES

- Burch, J. B., 1960: Some Snails and slugs of quarantine significance to the United States. *Sterkiana*, 2: 13-53.
- Cotton, B. C., 1954: A catalogue of introduced snails and slugs in Australia. *Rec. S. Aust. Mus.*, 11: 177-187.
- Gregg, W. O., 1958: A technique for preparing *in toto* mounts of molluscan anatomical dissections (abstract). *Rep. Am. malac. Un. Pacif. Div.* 1958: 39.
- Miller, J. S., 1822: *Ann. Philos. (N.S.)*, 3: 379.
- Pantin, C. F. A., 1948: *Notes on microscopical technique for zoologists*. Cambridge University Press, 79 pp.
- Pilsbry, H. A., 1946: Land Mollusca of North America (North of Mexico). *Monogr. Acad. nat. Sci. Philad.* No. 3, Vol. II, Part I.
- Quick, H. E., 1953: Helicellids introduced into Australia. *Proc. malac. Soc. Lond.*, 30: 74-79.
- Taylor, J. W., 1914: *Monograph of the Land and Freshwater Mollusca of the British Isles, Zonitidae, Endodontidae, Helicidae*. Taylor Brothers, Leeds, 522 pp.

ZUSAMMENFASSUNG

Oxychilus alliarius (Miller) ist in Süd Australien eingeführt worden. Die Chromosomenzahl, in primären Spermatozyten, ist $n = 30$. Die Anatomie der Geschlechtsorgane und der Radula wird beschrieben.